Testimony of
P. Joseph Grindstaff, Director
California Bay-Delta Authority

before the
Subcommittee on Energy and Resources

of the
Committee on Government Reform
United States House of Representatives

regarding
Conjunctive Water Management:
A Solution to the West's Growing Demand?

April 5, 2006

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Chairman Issa and members of the Subcommittee on Energy and Resources, I appreciate the opportunity to appear before you today to discuss conjunctive water management. I have been intimately familiar with conjunctive water management – also known as conjunctive use – both as a manager for local and regional water agencies in Southern California, and later as Chief Deputy Director for the California Department of Water Resources. I am currently the Director of the California Bay-Delta Authority.

Today I would like to provide an overview of conjunctive water management. I will also provide you with some examples of how it works across California and discuss some of the major challenges facing us. Finally, I will conclude with recommendations about how this vital form of water management can be improved.

The recently released update of the California Water Plan recognizes the need for a comprehensive approach and the need to work cooperatively in order to succeed in managing the state's water resources. The Plan looks at water as a resource whose management involves many responsibilities and raises many issues.

I am a firm believer that the water supply and reliability issues facing California and, frankly, many other parts of the nation and the world, cannot be solved by any one management strategy implemented by any one level of government or private sector enterprise. Only by using all the management options available, and through collaboration and cooperation at all levels of government and the private sector, will we be able to meet the demands of a growing population, maintain economic growth and prosperity, and do all this in a way that preserves and protects the natural environment.

Conjunctive water management is a vital part of that water management portfolio. It has been practiced in California to varying degrees since the Spanish mission era. The first known artificial recharge of groundwater in California occurred in Southern California during the late 1800s and is now used as a management tool throughout the state.

What is Conjunctive Management?

There are three primary components to a conjunctive water management project when the primary objective is to increase average water deliveries:

- The first is to recharge groundwater when surplus surface water is available to increase groundwater storage. In some areas this is accomplished by reducing groundwater use and substituting it with surface water, thus allowing natural recharge to increase groundwater storage. Another term for this is in-lieu recharge.
- The second component is to switch to groundwater use in dry years when surface water is scarce.
- The third component is to have a groundwater management institutional structure and an ongoing monitoring program to evaluate and allow water managers to respond to changes in groundwater, surface water, or environmental conditions that could violate management objectives or impact other water users.

Together, these components comprise a conjunctive water management project. Conjunctive water management projects may have other objectives in place of or in addition to improving average water deliveries. These other objectives may include improving water quality, reducing salt water intrusion, and reducing groundwater overdraft and land subsidence.

During the last three years, the Conjunctive Water Management Branch of the California Department of Water Resources has implemented several integrated programs to improve the management of groundwater resources in California. These improvements cover many facets of groundwater management. They include developing a basic understanding of individual groundwater basins, identifying basin management strategies or objectives, planning and conducting groundwater studies, and designing and constructing conjunctive use projects. The goal is to increase water supply reliability statewide through the planned, coordinated management and use of groundwater and surface water resources.

When the Conjunctive Water Management Program was formed seven years ago, local agencies had little trust in the overall objectives of the Program and minimal interest in participating. Since that time, the commitment to supporting local management of groundwater resources has allowed the Program to establish strong relationships with many local agencies. The Program has been able to fulfill commitments made to assist our partners' efforts to plan and implement conjunctive water use projects pursuant to the Program goal while, at the same time, providing both local management opportunities and water supply system reliability measures.

There is no comprehensive statewide data on the planning and implementation of conjunctive water management at the local agency level, but the Department of Water Resources' Conjunctive Water Management Program provides an indication of the types and magnitude of projects that water agencies are pursuing. Over the past five years, the Program awarded more than $250 million in grants and loans to leverage local and regional investment in projects throughout California with total costs more than $1billion. When fully implemented, the projects will provide more than 300,000 acre-feet of new water deliveries.

Examples of Conjunctive Management

Some examples illustrate the types of conjunctive management under way on a regional and local scale. In Southern California, including Kern County, conjunctive management has increased average-year water deliveries by more than 2 million acre-feet. Since 1990, artificial recharge in Kern County has helped to increase the water now in groundwater storage by 5.5 million acre-feet.

Santa Clara Valley Water District releases local supplies and imported water into more than 20 local creeks for artificial in-stream recharge and into more than 70 recharge ponds with an average annual recharge capacity of 138,000 acre-feet. Conjunctive management has virtually stopped land subsidence caused by heavy groundwater use and has allowed groundwater levels to recover to those of the early 1900s.

The Groundwater Replenishment System is a groundwater protection and water supply project jointly sponsored by the Orange County Water District and Orange County Sanitation District. The project will take highly treated urban wastewater and treat it to near distilled water quality using advanced membrane purification technologies. The water will be used to expand an existing underground seawater intrusion barrier as well as augment local groundwater supplies. The schedule calls for Phase 1 of the project to produce up to 72,000 acre-feet per year of recycled water, enough for 144,000 families each year, beginning in the Fall of 2007.

While conjunctive water management has been most prevalent in overdrafted groundwater basins, it can be applied in more water-rich areas as well. In the Sacramento Valley, water users are developing programs to use groundwater while transferring surface water to Delta exporters. The storage space created is often naturally refilled the following winter during times of surface water surplus.

Potential Benefits from Conjunctive Management

Conjunctive management is used to improve water supply reliability, to reduce groundwater overdraft and land subsidence, to protect water quality, and to improve

environmental conditions. Conservative estimates of additional implementation of conjunctive management indicate the potential to increase average annual water deliveries throughout the state by 500,000 acre-feet, with 9 million acre-feet of "new" groundwater storage. This new storage includes both re-operation of existing groundwater storage and recharging water into de-watered aquifer space. More aggressive estimates from screening level studies indicate the potential to increase average annual water deliveries by 2 million acre-feet with about 20 million acre-feet of new storage. The more aggressive estimates are based on assumptions that require major re-operation of existing surface water reservoirs and groundwater storage to achieve the benefits and do not fully consider the conveyance capacity constraints for exports from the Delta and other conveyance facilities.

The potential benefits from additional conjunctive water management are highly dependent on adequate water quality and the ability to capture, convey, and recharge surface water. These estimates are based on increases in local water deliveries from individual projects with project-specific sources of recharge supply and do not necessarily reflect a statewide increase in supply reliability. An increase in statewide supply reliability only occurs when the individual projects use water that would otherwise not be used by other water users or that is not needed for regulatory requirements such as water quality, fish and wildlife, and navigation. Expanding existing or developing new storage or conveyance infrastructure can increase the flexibility and ability to conduct conjunctive management projects. It is also possible to re-operate the existing system and to improve the underlying operational conditions to overcome these constraints.

In addition to water supply benefits, conjunctive management can provide environmental benefits when recharge basins are designed to be compatible with wildlife habitat, such as using natural floodplains and wetlands as recharge areas. Re-operation of surface water storage and using the water conjunctively with groundwater can avoid impacts to aquatic species by allowing better management of in-stream flow and water quality conditions.

Major Issues Facing Additional Conjunctive Management

Lack of Data – There is rarely a complete regional network to monitor groundwater levels, water quality, land subsidence, or the interaction of groundwater with surface water and the environment. Data is needed to evaluate conditions and trends on three planes: laterally over an area, vertically at different depths, and over time. Also, there is often a reluctance of individuals who own groundwater monitoring or supply wells to provide information or allow access to collect additional information. The result is that decisions are often made with only approximate knowledge of the system.

This uncertainty can make any change in groundwater use controversial. Additional investment in a monitoring network and data collection can help reduce this uncertainty, but must be done in accordance with a groundwater management plan that is acceptable to stakeholders in the basin.

Legal and Institutional issues – In many areas, political, institutional and legal obstacles stand in the way of implementing conjunctive use projects and effectively managing groundwater resources. For example, we need to encourage better coordination of groundwater management actions, which commonly are implemented under the authority of local water agencies, with land use decisions made by cities and counties. Land use decisions that lead to paving, channel lining, and other changes can have a major impact on the capacity to naturally recharge groundwater. Groundwater management agencies also must be involved early on in zoning and permitting for potential contamination from industry or septic systems.

County governments increasingly are becoming active in the area of groundwater management, with 27 of California's counties currently having groundwater ordinances. These ordinances are not always consistent or coordinated with local water agency groundwater management plans. Local governments and water agencies also need to resolve the potential for conflict that can arise when land is purchased for groundwater recharge facilities, thereby removing it from the local tax base.

As another example, the increasing use of aquifers for groundwater storage can lead to concerns or conflict over storage rights vs. water rights. Although the courts have adjudicated the water rights in many Southern California groundwater basins, the judgments are not always clear with respect to the right to store additional water in available aquifer space.

Infrastructure and Operational Constraints – Physical capacities of existing storage and conveyance facilities are often not large enough to capture surface water when it is available in wet years. Operational constraints may also limit the ability to use the full physical capacity of facilities. For example, permitted export capacity and efforts to protect fisheries and water quality in the Delta often limit the ability to move water to groundwater banks south of the Delta. Facilities that are operated for both temporary storage of flood water and groundwater recharge require more frequent maintenance to clean out excessive sediment often present in flood water.

Surface Water and Groundwater Management – In California, water management practices and the water rights system treat surface water and groundwater as two unconnected resources. In reality, there is often a high degree of hydrologic connection

between the two. Under predevelopment conditions, many streams received dry weather base flow from groundwater storage, and streams provided wet weather recharge to groundwater storage. Water quality and the environment can also be influenced by the interaction between surface water and groundwater. Failure to understand these connections can lead to unintended impacts. For example, studies by the University of California, Davis, indicate that long-term groundwater pumping in Sacramento County has reduced or eliminated dry season base flow in sections of the Cosumnes River with potential impacts to riparian habitat and anadromous fish.

In California, authority is separated among local, state and federal agencies for managing different aspects of groundwater and surface water resources. Several examples highlight this issue:

- First, the State Water Resources Control Board regulates surface water rights dating from 1914, but not rights dating before 1914;
- If that's not confusing enough, the State Board also regulates groundwater quality, but not the rights to use groundwater;
- On a local level, county groundwater ordinances and local agency groundwater management plans often only apply to a portion of the groundwater basin, and those with overlapping boundaries of responsibility do not necessarily have consistent management objectives; and finally,
- Except in adjudicated basins, individuals have few restrictions on how much groundwater they can use, provided the water is put to beneficial use on the overlying property.

As you can see, failure to integrate water management across jurisdictions makes it difficult to manage water for multiple benefits and provide for sustainable use, including the ability to identify and protect or mitigate potential impacts to third parties, ensure protection of legal rights of water users, establish rights to use vacant aquifer space and banked water, protect the environment, recognize and protect groundwater recharge and discharge areas, and protect public trust resources.

Water Quality – Groundwater quality can be degraded by naturally occurring or human introduced chemical constituents, low quality recharge water, or chemical reactions caused by mixing water of differing qualities. Protection of human health, the environment, and groundwater quality are all concerns for programs that recharge urban runoff or reclaimed/recycled water. The intended end use of the water can also influence the implementation of conjunctive management projects. For example, agriculture can generally use water of lower quality than needed for urban use, but certain crops can be sensitive to some constituents like boron.

New and changing water quality standards and emerging contaminants add uncertainty to implementing conjunctive management projects. A water source may, at the time it is used for recharge, meet all drinking water quality standards. Over time, however, detection capabilities improve and new or changed water quality standards become applicable. As a result, contaminants that were not previously identified or detected may become future water quality problems creating potential liability uncertainties. In some cases, conjunctive water management activities may need to be coordinated with groundwater clean up activities to achieve multiple benefits to both water supply and groundwater quality.

Myriad water quality regulations and public perception must be overcome to make the most effective use of source supplies for groundwater recharge. Proposals to recharge high quality treated wastewater have failed in many localities due to public outcry. The Orange County Water District project referenced above is an example where public outreach and education has overcome this obstacle. In other instances, conflict between drinking water and water quality protection regulations have made it difficult to recharge an aquifer with water that has been treated to meet all drinking water quality standards.

Environmental Concerns – Environmental concerns related to conjunctive management projects include potential impacts on habitat, water quality, and wildlife caused by shifting or increasing patterns of groundwater and surface water use. For example, floodwaters are typically considered "available" for recharge. However, flood flows serve an important function in the ecosystem. Removing or reducing these peak flows can negatively impact the ecosystem. A key challenge is to balance the in-stream flow and other environmental needs with the water supply aspects of conjunctive management projects. There may also be impacts from construction and operation of groundwater recharge basins and new conveyance facilities.

Funding – There is generally limited funding to develop the infrastructure and monitoring capability for conjunctive management projects. This includes funding to develop and implement groundwater management plans, to study and construct conjunctive management projects, and to track – statewide and regionally – changes in groundwater levels, groundwater flows, groundwater quality – including the location and spreading of contaminant plumes – land subsidence, changes in surface water flow, surface water quality, and the interaction and interrelated nature of surface water and groundwater.

Grant applications from DWR's Conjunctive Water Management Program show costs ranging from $10 to $600 per acre-foot of additional water delivered. This wide range of

costs is due to many factors, including project complexity, regional differences in construction and land costs, availability and quality of recharge supply, availability of infrastructure to capture, convey, recharge, and extract water, intended use of water, and treatment requirements. In general, urban uses can support higher project costs than agricultural uses.

The state and local investment in these projects of approximately $1 billion to attain 300,000 acre-feet of additional water, would translate to $1.7 billion for the conservative level of implementation and nearly $7 billion for the aggressive implementation.

Recommendations

California Water Plan Update 2005 is the product of a collaborative process that brought together the Department of Water Resources, a 65-member advisory committee representing urban, agricultural, and environmental interests, a 350-member extended review forum, and 2,000 interested members of the public. The result is a plan that includes the very best ideas for meeting our water challenges, and the following recommendations about conjunctive water management:

1. Local water management agencies should coordinate with other agencies that are involved in activities that might affect long term sustainability of water supply and water quality within or adjacent to a groundwater basin. Such regional coordination will take different forms in each area because of dissimilar political, legal, institutional, technical, and economic constraints and opportunities, but will likely include agencies with authority over managing groundwater and surface water quantity and quality, land use planning, human health, and environmental protection. Regional groundwater management plans should be developed with assistance from an advisory committee of stakeholders to help guide the development, educational outreach, and implementation of the plans.

2. Continue funding for local groundwater monitoring and management activities and feasibility studies that enhance the coordinated use of groundwater and surface water. Additional monitoring and analysis is needed to track, both statewide and regionally, changes in groundwater levels, groundwater flows, groundwater quality (including the location and spreading of contaminant plumes), land subsidence, changes in surface water flow, surface water quality, and the interaction and interrelated nature of surface water and groundwater. There is a need to develop comprehensive data and data management systems to track existing, proposed, and potential conjunctive management projects throughout the state and identify and evaluate regional and statewide implementation constraints, including availability of water to recharge, ability to

convey water from source to destination, water quality issues, environmental issues, and costs and benefits.

3. Give priority for funding and technical assistance to conjunctive management projects that are conducted in accordance with a groundwater management plan, increase water supplies, and have other benefits including the sustainable use of groundwater, maintaining or improving water quality, and enhancing the environment. Additional preference should be given for projects conducted in accordance with a basinwide groundwater management plan. In addition, allow funding for projects that make use of wet season/dry season supply variability, not just wet-year/dry-year variability.

4. Assess groundwater management to provide an understanding of how local agencies are implementing actions to use and protect groundwater, an understanding of which actions are working at the local level and which are not working, and how state programs can be improved to help agencies prepare effective groundwater management plans.

5. Improve coordination and cooperation among local, state, and federal agencies with differing responsibilities for groundwater and surface water management and monitoring to facilitate conjunctive management, to ensure efficient use of resources, to provide timely regulatory approvals, to prevent conflicting rules or guidelines, and to promote easy access to information by the public.

6. Encourage local groundwater management authorities to manage the use of vacant aquifer space for artificial recharge and to develop multi-benefit projects that generate source water for groundwater storage by capturing water that would otherwise not be used by other water users or the environment. For example, through reservoir re-operation, water recycling and reuse, and water conservation.

7. Include wildlife agencies in the loop to streamline the environmental permitting process for the development of conjunctive management facilities, like recharge basins, when they are designed with pre-defined benefits or mitigation to wildlife and wildlife habitat.